$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Question	Scheme		Marks	AOs
Way 1 $(10\cos s)^2 + (4\sqrt{2}\sin t)^2 = 66$ M1 3.1a $100(1-\sin^2 t) + 32\sin^2 t = 60$ $100\cos^2 t + 32(1-\cos^2 t) = 66$ M1 2.1 $100 - 68\sin^2 t = 66 \Rightarrow \sin^2 t = \frac{1}{2}$ $\Rightarrow \sin t =$ $\Rightarrow \cos t =$ $\Rightarrow dM1$ 1.1b $100 - 68\sin^2 t = 66 \Rightarrow \sin^2 t = \frac{1}{2}$ $\Rightarrow \cos t =$ $\Rightarrow \cos t =$ $\Rightarrow dM1$ 1.1b Substitutes their solution back into the relevant original equation(s) to get the value of the <i>x</i> -coordinate. M1 1.1b Note: These may not be in the correct quadrant M1 3.1a $x = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y = -4$ or $S = (awrt 7.07, -4)$ A1 3.2a Way 2 $\{\cos^2 t + \sin^2 t = 1 \Rightarrow \}$ $(\frac{x}{4\sqrt{2}})^2 = 1$ $(50 - y^2 + y^2)^2 = 1$ A1 1.1b $32x^2 + 6600 - 100x^2 = 3200$ $y^2 = 16 \Rightarrow y =$ M1 3.1a Substitutes their solution back into the relevant original equation(s) to get the value of the corresponding v-coordinate or y-coordinate. M1 1.1b $32x^2 + 6600 - 100x^2 = 3200$ $y^2 = 16 \Rightarrow y =$ M1 1.1b 1.1b $32x^2 + 6600 - 100x^2 = 3200$ $y^2 = 16 \Rightarrow y =$ M1 1.1b Substitutes their solution back into the relevant original equation(s) to get the value of the corresponding v-c	4	$C_1: x = 10\cos t, y = 4\sqrt{2}\sin t,$	$C_1: x = 10\cos t, y = 4\sqrt{2}\sin t, 0 \le t < 2\pi; C_2: x^2 + y^2 = 66$		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Way 1	$(10\cos t)^2 + (4$	$(10\cos t)^2 + (4\sqrt{2}\sin t)^2 = 66$		3.1a
$Way 2 = \begin{cases} \cos(t - \sin t) + 2\sin t - 2\cos t + 2\cos t + 2\sin t - 2\cos t - 2\cos t - \frac{1}{2} \\ \Rightarrow \sin t - \ldots \\ Substitutes their solution back into the relevant original equation(s) to get the value of the x-coordinate and value x-coordinate x-doe x-do$		$100(1 - \sin^2 t) + 32\sin^2 t - 66$	$100\cos^2 t + 32(1 - \cos^2 t) = 66$	M1	2.1
$\begin{array}{ c c c c c c } \hline 100-68\sin^2t-66\Rightarrow\sin^2t-\frac{1}{2}\\ \Rightarrow \sin t=\\ \hline sin t=\\ \hline sin t=\\ \hline substitutes their solution back into the relevant original equation(s) to get the value of the x-coordinate and value of the corresponding y-coordinate. \\ \hline Note: These may not be in the correct quadrant\\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-2 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Set(5wr final A0 for writing x=5\sqrt{2}, y=-4 \\ \hline Set(5\sqrt{2}, -4) \text{ or } x=5\sqrt{2}, y=-4 \text{ or } S=(awrt 7.07, -4) \\ \hline A1 \\ \hline Se$		$100(1-\sin t)+32\sin t=00$	$100003 \ t + 32(1 - 003 \ t) = 00$	A1	1.1b
Substitutes their solution back into the relevant original equation(s) to get the value of the x-coordinate and value of the coorresponding y-coordinate.M11.1bNote: These may not be in the correct quadrantSubstitutes their solution back into the relevant original equation(s) to get the value of the x-coordinate.Way 2(cos ² t + sin ² t = 1 \Rightarrow) $\left(\frac{x}{10}\right)^2 + \left(\frac{y}{4\sqrt{2}}\right)^2$ = 1 { \Rightarrow 32x ² + 100y ² = 3200} y ² = 1 A1A1Xibit and the relevant original equation(s) to get the value of the corresponding x-coordinate.M12.132x ² + 100y ² = 3200 y ² = 16 \Rightarrow y =x ² = 50 \Rightarrow x =y ² = 16 \Rightarrow y =Substitutes their solution back into the relevant original equation(s) to get the value of the corresponding x-coordinate.M11.1bSubstitutes their solution back into the relevant original equation(s) to get the value of the corresponding x-coordinate.M11.1bSubstitutes their solution back into the relevant original equation(s) to get the value of the corresponding x-coordinate.M11.1bSubstitutes their solution back into the relevant original equation(s) to get the value of the x-coordinate on y-coordinate.M11.1bSubstitutes their solution back into the relevant original equation(s) to get the value of the x-coordinate on y-coordinate.M11.1bSubstitutes their solution back i		$100 - 68\sin^2 t = 66 \implies \sin^2 t = \frac{1}{2}$ $\implies \sin t = \dots$	$68\cos^2 t + 32 = 66 \implies \cos^2 t = \frac{1}{2}$ $\implies \cos t = \dots$	dM1	1.1b
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Substitutes their solution back into the relevant original equation(s) to get the value of the <i>x</i> -coordinate and value of the corresponding <i>y</i> -coordinate. Note: These may not be in the correct quadrant		M1	1.1b
Way 2 {(cos ² t + sin ² t = 1 ⇒} $\left(\frac{x}{10}\right)^2 + \left(\frac{y}{4\sqrt{2}}\right)^2 = 1$ {⇒ $32x^2 + 100y^2 = 3200$ } M1 M1 3.1a $\frac{x^2}{100} + \frac{66 - x^2}{32} = 1$ $\frac{66 - y^2}{100} + \frac{y^2}{32} = 1$ M1 2.1 $32x^2 + 6600 - 100x^2 = 3200$ $2112 - 32y^2 + 100y^2 = 3200$ $x^2 = 50 \Rightarrow x =$ $y^2 = 16 \Rightarrow y =$ M1 1.1b $32x^2 + 6600 - 100x^2 = 3200$ $x^2 = 50 \Rightarrow x =$ $y^2 = 16 \Rightarrow y =$ M1 1.1b Substitutes their solution back into the relevant original equation(s) to get the value of the corresponding x-coordinate or y-coordinate. M1 1.1b Note: These may not be in the correct quadrant S = (5\sqrt{2}, -4) \text{ or } x = 5\sqrt{2}, y = -4 \text{ or } S = (awrt 7.07, -4) A1 3.2a (6) Way 3 {C_2 : x^2 + y^2 = 66 ⇒} x = \sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha M1 3.1a {cos ² a + sin ² a = 1 ⇒} {10 \cos t = \sqrt{66} \cos \alpha, x = \sqrt{66} \sin \alpha M1 3.1a {cos ² a + sin ² a = 1 ⇒} {10 (\cos t)^2 + (4\sqrt{2} \sin t)^2 = 6} M1 3.1a Way 4 (10 cos t)^2 + (4\sqrt{2} \sin t)^2 = 66 M1 3.1a Substitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate. M1 1.1b Substitutes their solution back into the original equation(s) to get the value of th		$S = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y = -4$ or $S = (awrt 7.07, -4)$		A1	3.2a
Way 2 {					
	Way 2	$\{\cos^2 t + \sin^2 t = 1 \Longrightarrow\} \left(\frac{x}{10}\right)^2 + \left(\frac{y}{4\sqrt{2}}\right)^2 = 1 \{\Rightarrow 32x^2 + 100y^2 = 3200\}$		M1	3.1a
$\frac{100}{100} + \frac{32}{32} = 1$ $\frac{100}{100} + \frac{32}{32} = 1$ $A1$ $A1$ $A1$ $A1$ $A1$ $A1$ $A1$ A		x^2 66 - x^2 1	$66 - y^2 + y^2 = 1$	M1	2.1
$\frac{32x^2 + 6600 - 100x^2 = 3200}{x^2 = 50 \Rightarrow x =} \qquad 2112 - 32y^2 + 100y^2 = 3200}{y^2 = 16 \Rightarrow y =} \qquad dM1 \qquad 1.1b$ Substitutes their solution back into the relevant original equation(s) to get the value of the corresponding x-coordinate or y-coordinate. M1 1.1b Note: These may not be in the correct quadrant $\frac{S = (5\sqrt{2}, -4) \text{ or } x = 5\sqrt{2}, y = -4 \text{ or } S = (awrt 7.07, -4) \qquad A1 \qquad 3.2a}{(6)}$ Way 3 $\begin{cases} C_2 : x^2 + y^2 = 66 \Rightarrow \} x = \sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha \\ \{C_1 = C_2 \Rightarrow \} \ 10 \cos t = \sqrt{66} \cos \alpha, 4 \sqrt{2} \sin t = \sqrt{66} \sin \alpha \\ \{\cos^2 \alpha + \sin^2 \alpha = 1 \Rightarrow \} \ \left(\frac{10 \cos t}{\sqrt{66}}\right)^2 + \left(\frac{4\sqrt{2} \sin t}{\sqrt{66}}\right)^2 = 1 \end{cases}$ M1 3.1a $\begin{cases} way 4 \qquad (10 \cos t)^2 + (4\sqrt{2} \sin t)^2 = 66 & M1 \\ 1.1b & 3.1a \\ 100\left(\frac{1 + \cos 2t}{2}\right) + 32\left(\frac{1 - \cos 2t}{2}\right) = 66 & M1 \\ 3.1a & 1.1b \\ 1.1b & 50 + 50 \cos 2t + 16 - 16 \cos 2t = 66 \Rightarrow 34 \cos 2t + 66 = 66 \\ \Rightarrow \cos 2t = & M1 \\ 1.1b & 1.1b \\ 1.1b & 1.1b \\ \hline \\ Note: These may not be in the correct quadrant \\ S = (5\sqrt{2}, -4) \text{ or } x = 5\sqrt{2}, y = -4 \text{ or } S = (awrt 7.07, -4) & A1 \\ 3.2a & (6) \\ \hline \\ Note: Give final A0 for writing x = 5\sqrt{2}, y = -4 \\ followed by S = (-4, 5\sqrt{2}) \\ \hline \\ \end{cases}$		$\frac{100}{100} + \frac{32}{32} = 1$	$\frac{1}{100} + \frac{1}{32} = 1$	A1	1.1b
Substitutes their solution back into the relevant original equation(s) to get the value of the corresponding x-coordinate or y-coordinate. Note: These may not be in the correct quadrantM11.1bS = $(5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y = -4$ or $S = (awrt 7.07, -4)$ A13.2aWay 3 $\{C_2 : x^2 + y^2 = 66 \Rightarrow\} x = \sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha$ $\{C_1 = C_2 \Rightarrow\}$ 10 cost = $\sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha$ $\{C_1 = C_2 \Rightarrow\}$ M13.1a $\{\cos^2 \alpha + \sin^2 \alpha = 1 \Rightarrow\}$ $\left(\frac{10 \cos t}{\sqrt{66}}\right)^2 + \left(\frac{4\sqrt{2} \sin t}{\sqrt{66}}\right)^2 = 1$ M13.1aWay 4 $(10 \cos t)^2 + (4\sqrt{2} \sin t)^2 = 66$ M13.1a $100\left(\frac{1 + \cos 2t}{2}\right) + 32\left(\frac{1 - \cos 2t}{2}\right) = 66$ M12.1A11.1b1.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M1Note: These may not be in the correct quadrantM11.1bNote: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ A13.2aNote: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ G6Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ G6Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ G6		$32x^{2} + 6600 - 100x^{2} = 3200$ $x^{2} = 50 \implies x = \dots$	$2112 - 32y^2 + 100y^2 = 3200$ $y^2 = 16 \implies y =$	dM1	1.1b
$\frac{S = (5\sqrt{2}, -4) \text{ or } x = 5\sqrt{2}, y = -4 \text{ or } S = (awrt 7.07, -4) $ A1 3.2a (6) Way 3 $\{C_{2} : x^{2} + y^{2} = 66 \Rightarrow\} x = \sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha$ $\{C_{1} = C_{2} \Rightarrow\} 10 \cos t = \sqrt{66} \cos \alpha, 4\sqrt{2} \sin t = \sqrt{66} \sin \alpha$ $\{\cos^{2} \alpha + \sin^{2} \alpha = 1 \Rightarrow\} \left(\frac{10 \cos t}{\sqrt{66}}\right)^{2} + \left(\frac{4\sqrt{2} \sin t}{\sqrt{66}}\right)^{2} = 1 $ M1 3.1a ($\cos^{2} \alpha + \sin^{2} \alpha = 1 \Rightarrow\} \left(\frac{10 \cos t}{\sqrt{66}}\right)^{2} + \left(\frac{4\sqrt{2} \sin t}{\sqrt{66}}\right)^{2} = 1$ Way 4 $(10 \cos t)^{2} + (4\sqrt{2} \sin t)^{2} = 66 $ M1 3.1a 100 $\left(\frac{1 + \cos 2t}{2}\right) + 32\left(\frac{1 - \cos 2t}{2}\right) = 66 $ M1 2.1 A1 1.1b 50 + 50 \cos 2t + 16 - 16 \cos 2t = 66 \Rightarrow 34 \cos 2t + 66 = 66 \Rightarrow \cos 2t =Substitutes their solution back into the original equation(s) to get the value of the <i>x</i> -coordinate and value of the <i>y</i> -coordinate. Note: These may not be in the correct quadrant $S = (5\sqrt{2}, -4) \text{ or } x = 5\sqrt{2}, y = -4 \text{ or } S = (awrt 7.07, -4) $ A1 3.2a (6) Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$		Substitutes their solution back into the relevant original equation(s) to get the value of the corresponding <i>x</i> -coordinate or <i>y</i> -coordinate. Note: These may not be in the correct quadrant		M1	1.1b
Way 3 $\{C_2: x^2 + y^2 = 66 \Rightarrow\} x = \sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha$ $\{C_1 = C_2 \Rightarrow\} 10 \cos t = \sqrt{66} \cos \alpha, 4\sqrt{2} \sin t = \sqrt{66} \sin \alpha$ $\{\cos^2 \alpha + \sin^2 \alpha = 1 \Rightarrow\} \left(\frac{10 \cos t}{\sqrt{66}}\right)^2 + \left(\frac{4\sqrt{2} \sin t}{\sqrt{66}}\right)^2 = 1$ M13.1aWay 4 $(10 \cos t)^2 + (4\sqrt{2} \sin t)^2 = 66$ M13.1aWay 4 $(10 \cos t)^2 + (4\sqrt{2} \sin t)^2 = 66$ M13.1aSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their Give final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6)M1Note:Give final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6 marks)		$S = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y = -4$ or $S = (avrt 7.07, -4)$			3.2a
Way 3 $\{C_2: x^2 + y^2 = 66 \Rightarrow\} x = \sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha$ $\{C_1 = C_2 \Rightarrow\} 10 \cos t = \sqrt{66} \cos \alpha, 4\sqrt{2} \sin t = \sqrt{66} \sin \alpha$ $\{\cos^2 \alpha + \sin^2 \alpha = 1 \Rightarrow\} \left(\frac{10 \cos t}{\sqrt{66}}\right)^2 + \left(\frac{4\sqrt{2} \sin t}{\sqrt{66}}\right)^2 = 1$ M13.1aWay 4 $(10 \cos t)^2 + (4\sqrt{2} \sin t)^2 = 66$ M13.1aWay 4 $(10 \cos t)^2 + (4\sqrt{2} \sin t)^2 = 66$ M13.1aSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M13.2a(6)Note: These may not be in the correct quadrantM13.2aSubstitutes their final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ A13.2aNote: for Our string $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6 marks)					
then continue with applying the mark scheme for Way 1Way 4 $(10\cos t)^2 + (4\sqrt{2}\sin t)^2 = 66$ M13.1a $100\left(\frac{1+\cos 2t}{2}\right) + 32\left(\frac{1-\cos 2t}{2}\right) = 66$ M12.1 $50+50\cos 2t+16-16\cos 2t = 66 \Rightarrow 34\cos 2t+66=66$ M11.1b $50+50\cos 2t+16-16\cos 2t = 66 \Rightarrow 34\cos 2t+66=66$ M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.2bSubstitutes their solution back into the original equation (s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bSubstitutes their solution back into the original equation (s) to get the value of the x-coordinate and value of the y-coordinate.M11.2bNote: These may not be in the correct quadrantM13.2a3.2a(6)M13.2a(6)1.2bNote: Give final A0 for writing $x = 5\sqrt{2}$, $y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6)	Way 3	$\{C_2: x^2 + y^2 = 66 \Rightarrow\} x = \sqrt{66} \cos \alpha, y = \sqrt{66} \sin \alpha$ $\{C_1 = C_2 \Rightarrow\} 10 \cos t = \sqrt{66} \cos \alpha, 4\sqrt{2} \sin t = \sqrt{66} \sin \alpha$ $\{\cos^2 \alpha + \sin^2 \alpha = 1 \Rightarrow\} \left(\frac{10 \cos t}{\sqrt{66}}\right)^2 + \left(\frac{4\sqrt{2} \sin t}{\sqrt{66}}\right)^2 = 1$		M1	3.1a
Way 4 $(10\cos t)^2 + (4\sqrt{2}\sin t)^2 = 66$ M13.1a $100\left(\frac{1+\cos 2t}{2}\right) + 32\left(\frac{1-\cos 2t}{2}\right) = 66$ M12.1A11.1b $50+50\cos 2t+16-16\cos 2t = 66 \Rightarrow 34\cos 2t+66=66$ dM11.1b $\Rightarrow \cos 2t =$ dM11.1bSubstitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate. Note: These may not be in the correct quadrantM11.1b $S = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y = -4$ or $S = (awrt 7.07, -4)$ A13.2a(6)Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6)		then continue with applying the mark scheme for Way 1			
$\frac{100\left(\frac{1+\cos 2t}{2}\right)+32\left(\frac{1-\cos 2t}{2}\right)=66}{M1} = 66$ $\frac{M1}{A1} = \frac{1.1b}{A1}$ $\frac{50+50\cos 2t+16-16\cos 2t=66 \Rightarrow 34\cos 2t+66=66}{\Rightarrow \cos 2t=}$ $\frac{dM1}{A1} = \frac{1.1b}{A1}$ $\frac{M1}{A1} = \frac{1.1b}{A1}$ $\frac{M1}{A1$	Way 4	$(10\cos t)^2 + (4\sqrt{2}\sin t)^2 = 66$		M1	3.1a
$\frac{(2)(2)(2)}{50+50\cos 2t+16-16\cos 2t=66 \Rightarrow 34\cos 2t+66=66}$ $\Rightarrow \cos 2t = \dots$ Substitutes their solution back into the original equation(s) to get the value of the <i>x</i> -coordinate and value of the <i>y</i> -coordinate. M1 1.1b Note: These may not be in the correct quadrant $S = (5\sqrt{2}, -4) \text{ or } x = 5\sqrt{2}, y = -4 \text{ or } S = (awrt 7.07, -4) $ A1 3.2a (6) Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6 marks)		$100\left(\frac{1+\cos 2t}{2}\right)+32\left(\frac{1-\cos 2t}{2}\right)=66$		M1	2.1
$Substitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate. M1 1.1b Note: These may not be in the correct quadrant S = (5\sqrt{2}, -4) \text{ or } x = 5\sqrt{2}, y = -4 \text{ or } S = (awrt 7.07, -4) A1 3.2a(6)Note: Give final A0 for writing x = 5\sqrt{2}, y = -4followed by S = (-4, 5\sqrt{2})Note: Give final A0 for writing x = 5\sqrt{2}, y = -4(6)Note: Give final A0 for writing x = 5\sqrt{2}, y = -4(6)$		(2)	$\begin{pmatrix} 2 \end{pmatrix}$	A1	1.1b
Substitutes their solution back into the original equation(s) to get the value of the x-coordinate and value of the y-coordinate.M11.1bNote: These may not be in the correct quadrantM11.1b $S = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y = -4$ or $S = (awrt 7.07, -4)$ A13.2a(6)(6)Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6)		$30 + 30\cos 2i + 10 - 10\cos 2i$ $\Rightarrow \cos 2i \sin 2i$	$= 00 \implies 34\cos 2t + 00 = 00$ $2t = \dots$	dM1	1.1b
$S = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y = -4$ or $S = (awrt 7.07, -4)$ A1 3.2a (6) (6) Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ (6) followed by $S = (-4, 5\sqrt{2})$ (6) Note: for Output for A		Substitutes their solution back into value of the <i>x</i> -coordinate an Note: These may not be	the original equation(s) to get the d value of the y-coordinate. e in the correct quadrant	M1	1.1b
Note: Give final A0 for writing $x = 5\sqrt{2}, y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6)Note: for Ouestion 4		$S = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}, y$	s = -4 or $S = (awrt 7.07, -4)$	A1	3.2a
Note: Give final A0 for writing $x = 5\sqrt{2}$, $y = -4$ followed by $S = (-4, 5\sqrt{2})$ (6 marks)					
followed by $S = (-4, 5\sqrt{2})$ (6 marks)		Note: Give final A0 for writing $x = 5\sqrt{2}$, $y = -4$			
(6 marks)		followed by $S = (-4, 5\sqrt{2})$			
\ldots		(6 marks)		

	Way 1				
M1:	Begins to solve the problem by applying an appropriate strategy.				
	E.g. Way 1: A complete process of combining equations for C_1 and C_2 by substituting the				
	parametric equation into the Cartesian equation to give an equation in one variable (i.e. t) only.				
M1:	Uses the identity $\sin^2 t + \cos^2 t \equiv 1$ to achieve an equation in $\sin^2 t$ only or $\cos^2 t$ only				
A1:	A correct equation in $\sin^2 t$ only or $\cos^2 t$ only				
dM1:	dependent on both the previous M marks				
	Rearranges to make $\sin t = \dots$ where $-1 \le \sin t \le 1$ or $\cos t = \dots$ where $-1 \le \cos t \le 1$				
Note:	Condone 3 rd M1 for $\sin^2 t = \frac{1}{2} \Longrightarrow \sin t = \frac{1}{4}$				
M1:	See scheme				
A1:	Selects the correct coordinates for <i>S</i>				
	Allow either $S = (5\sqrt{2}, -4)$ or $S = (awrt 7.07, -4)$				
	Wav 2				
M1:	Begins to solve the problem by applying an appropriate strategy.				
	E.g. Way 2: A complete process of using $\cos^2 t + \sin^2 t \equiv 1$ to convert the parametric equation				
	for C_1 into a Cartesian equation for C_1				
M1:	Complete valid attempt to write an equation in terms of x only or y only not involving				
	trigonometry				
A1:	A correct equation in x only or y only not involving trigonometry				
dM1:	dependent on both the previous M marks				
	Rearranges to make $x = \dots$ or $y = \dots$				
Note:	their x^2 or their y^2 must be >0 for this mark				
M1:	See scheme				
Note:	their x^2 and their y^2 must be >0 for this mark				
A1:	Selects the correct coordinates for <i>S</i>				
	Allow either $S = (5\sqrt{2}, -4)$ or $S = (awrt 7.07, -4)$ or $S = (\sqrt{50}, -4)$ or $S = \left(\frac{10}{\sqrt{2}}, -4\right)$				
	Way 3				
M1:	Begins to solve the problem by applying an appropriate strategy.				
	E.g. Way 3: A complete process of writing C_2 in parametric form, combining the parametric				
	equations of C_1 and C_2 and applying $\cos^2 \alpha + \sin^2 \alpha \equiv 1$ to give an equation in one variable				
	(i.e. <i>t</i>) only.				
	then continue with applying the mark scheme for Way 1				
	Way 4				
M1:	Begins to solve the problem by applying an appropriate strategy.				
	E.g. Way 4: A complete process of combining equations for C_1 and C_2 by substituting the				
	parametric equation into the Cartesian equation to give an equation in one variable (i.e. <i>t</i>) only.				
M1:	Uses the identities $\cos 2t \equiv 2\cos^2 t - 1$ and $\cos 2t \equiv 1 - 2\sin^2 t$ to achieve an equation in $\cos 2t$ only				
Note:	At least one of $\cos 2t \equiv 2\cos^2 t - 1$ or $\cos 2t \equiv 1 - 2\sin^2 t$ must be correct for this mark.				
A1:	A correct equation in cos 2t only				
dM1:	dependent on both the previous M marks				
N /1.	Rearranges to make $\cos 2t = \dots$ where $-1 \le \cos 2t \ge 1$				
MI:	See scheme				
AI:	Selects the correct coordinates for 3				
	Allow either $S = (5\sqrt{2}, -4)$ or $S = (awrt 7.07, -4)$ or $S = (\sqrt{50}, -4)$ or $S = \left(\frac{10}{\sqrt{2}}, -4\right)$				

4	$C_1: x = 10\cos t, y = 4\sqrt{2}\sin t$	$C_1: x = 10\cos t, y = 4\sqrt{2}\sin t, 0 \le t < 2\pi; C_2: x^2 + y^2 = 66$				
Way 5	$(10\cos t)^2 +$	$(10\cos t)^2 + (4\sqrt{2}\sin t)^2 = 66$		3.1a		
	$(10 \operatorname{cost})^2 + (4 \sqrt{2} \operatorname{s})^2$	$(10 \cos t)^2 + (1 \sqrt{2} \sin t)^2 - (1 (\sin^2 t + \cos^2 t))$	M1	2.1		
	$(10\cos i) + (4\sqrt{2}s)$	$\sin t = \cos(\sin t + \cos t)$	A1	1.1b		
	$100\cos^2 t + 32\sin^2 t = 66\sin^2 \Rightarrow$	$t + 66\cos^2 t \implies 34\cos^2 t = 34\sin^2 t$ $\tan t = \dots$	dM1	1.1b		
	Substitutes their solution back to get the value of the s correspond Note: These may no	into the relevant original equation(s) x-coordinate and value of the ling y-coordinate. t be in the correct quadrant	M1	1.1b		
	$S = (5\sqrt{2}, -4)$ or $x = 5\sqrt{2}$	y = -4 or $S = (awrt 7.07, -4)$	A1	3.2a		
			(6)			
	Way 5					
M1:	Begins to solve the problem by applyi	gins to solve the problem by applying an appropriate strategy.				
	.g. Way 5: A complete process of combining equations for C_1 and C_2 by substituting the					
	parametric equation into the Cartesian	ametric equation into the Cartesian equation to give an equation in one variable (i.e. <i>t</i>) only.				
M1:	Jses the identity $\sin^2 t + \cos^2 t \equiv 1$ to achieve an equation in $\sin^2 t$ only and $\cos^2 t$ only with no constant term					
A1:	A correct equation in $\sin^2 t$ and $\cos^2 t$ containing no constant term					
dM1:	dependent on both the previous M marks					
	Rearranges to make $\tan t = \dots$					
M1:	See scheme					
A1:	Selects the correct coordinates for <i>S</i>					
	Allow either $S = (5\sqrt{2}, -4)$ or $S = (awrt 7.07, -4)$ or $S = (\sqrt{50}, -4)$ or $S = \left(\frac{10}{\sqrt{2}}, -4\right)$					